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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/931,079	08/17/2001	Duck Chul Hwang	1567.1018	2871

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EXAMINER

WILLS, MONIQUE M

ART UNIT	PAPER NUMBER
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1746

DATE MAILED: 04/05/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary	Application No. 09/931,079	Applicant(s) HWANG ET AL.	
	Examiner Wills M Monique	Art Unit 1746	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 January 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,4-11,13-15,17-22,24-28,30-32,34 and 35 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,4-11,13-15,17-22,24-28,30-32,34 and 35 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 17 August 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

This Office Action is responsive to the Amendment filed January 7, 2004. The objection of claims 9 & 18 is overcome. The rejection of claims 9 & 18, under 35 U.S.C. 112, second paragraph is overcome. The rejection of claims 1-4, 6, 9, 11, 12, 14-20, 22-24, 27 & 28-35 under 35 U.S.C. 102(e) as being anticipated by Nakagiri et al., U.S. Patent 6,576,370 is overcome. Claims 1, 4-11, 13-15, 17-22, 24-28, 30-32 & 34-35 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The rejection of claims 1, 4-5, 9, 10, 11, 14, 15-22 & 24-27 under 35 U.S.C. 102(e) as being anticipated by Geronov et al., U.S. Patent 6,344,293, is maintained. Claims 1, 4, 6, 9-11, 14-15, 17-22, 24-27 & 28, 30-32 & 34-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakagiri et al., U.S. Patent 6,576,370. The rejection of claim 13 under 35 U.S.C. 103(a) as being unpatentable over Geronov et al., U.S. Patent 6,344,293 as applied to claims 1 & 5 above, in view of Semel et al., U.S. Patent 5,298,055, is maintained. The rejection of claim 7 under 35 U.S.C. 103(a) as being unpatentable over Nakagiri et al. U.S. Patent 6,576,370 as applied to claim 1, and further in view of Carson U.S. Patent 6,488,721, is maintained. The rejection of claim 8 under 35 U.S.C. 103(a) as being unpatentable over Nakagiri et

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al. U.S. Patent 6,576,370 as applied to claim 1, and further in view of Igarashi et al. U.S. Patent 6,573,004, is maintained.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1, 4-11, 13-15, 17-22, 24-28, 30-32 & 34-35 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The specification does not provide support of "not including tetrahydrofuran, propylene carbonate or ethylene carbonate". The specification does not support exclusion of these organic solvents.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 4-5, 9-11, 14, 15, 17-22 & 24-27 are rejected under 35 U.S.C. 102(e) as being anticipated by Geronov et al. U.S. Patent 6,344,293.

With respect to claims, 1, 4-5, 15, 24 & 27, Geronov teaches a cathodic material comprising an electroactive polycarbon-sulfide material of $C(S_x)$ (col. 7, lines 35-40) wherein x ranges from 2.5 to 50 (col. 7, lines 40-50), a conductive agent of graphite or conductive carbons (col. 9, lines 1-5), a binder in the amount of 2 to 30% by weight (col. 9, lines 15-20) including polyethylene oxide and polyvinylidene fluoride (col. 9, lines 15-20), and an electrolyte solvent such as acetonitrile, ethanol and toluene (col. 9, lines 45-50). With respect to claims 9 & 18, the cathode material includes an electroactive polycarbon-sulfide material of $C(S_x)$ (col. 7, lines 35-40). With respect to claim 10, the binder is present in the amount of 2 to 30% by weight (col. 9, lines 15-20). With respect to claim 14, the conductive agent is graphite or conductive carbon (col. 9, lines 1-5).

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With respect to claim 15, the negative electrode includes lithium metal and lithium alloys (col. 10, lines 15-20). With respect to claim 17, the binder is polyethylene oxide (col. 9, lines 45-50). With respect to claim 19, the electrolyte solvent includes 1,3-dioxolane (col. 11, lines 35-40). With respect to claim 20 & 21, the electrolyte comprises a 1.4M solution of lithium bis (trifluoromethylsulfonyl) imide (Example 1). The instant claims are anticipated by the prior art set forth. The limitation in claims 1, 11, 15 & 22, with respect to the organic mixing solvent having a solubility of sulfur equal to or less than 50mM, is considered to be an inherent property of the electrolyte solvent as set forth in the prior art, because Geronov employs the same electrolyte solvents set forth by Applicant. Further, "products of identical chemical composition can not have mutually exclusive properties." A chemical composition and its properties are inseparable. Therefore, if the prior art teaches the identical chemical structure, the properties applicant discloses and/or claims are necessarily present. In re Spada, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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Claims 1, 4, 6, 9-11, 14-15, 17-22, 24-27 & 28, 30-32 & 34-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakagiri et al. U.S. Patent 6,576,370.

Nakagiri teaches a positive electrode for a lithium sulfur battery comprising a lithium sulfide of the formula $(\text{Li}_x\text{S})_n$ where $0 < x \leq 2$ and $n > 0$ (see abstract). With respect to claims 1, 15, 24, 27, 28 & 32, Nakagiri teaches a positive electrode comprising: Li_2S_2 , Li_2S_4 , Li_2S_6 , Li_2S_8 , Li_2S_{12} active material (col. 6, lines 35-40); a conductive agent such as carbon powder, carbon fibers, graphite, acetylene black and graphite fibers (col. 8, lines 1-5); an organic polymer binder such as polyvinyl pyrrolidone or polyvinylidene fluoride (col. 7, lines 60-68); and an organic mixing solvent where solubility of sulfur is equal to or less than 50mM, such as tetrahydrofuran, N,N-dimethylformamide and N-R-2-pyrrolidone (col. 3, lines 35-40). Additionally, the positive electrode may include acetonitrile (example 1), dimethylformamide (col. 3, lines 35-40) and a polyethylene oxide binder (col. 7, lines 50-60). With respect to claims 28, & 32, the method of making the positive electrode includes: dissolving polyvinylidene fluoride in polypropylene carbonate (col. 7, lines 55-65); mixing a conductive agent and homogeneous dispersion of the cathodic material (col. 9, lines 5-10 & Example 1) to make a slurry; coating the slurry on a current collector and drying the coated current collector. See column 8, lines 15-60 and Example 1. With respect to claims 4, 17 & 25, the binder may include polyethylene oxide (col. 7, lines 55-60). With respect to claims 6, 30, 31, 34 & 35, the binder is polyvinyl pyrrolidone (col. 7, lines 55-60) and the mixing solvent is dimethyl formamide (col. 8, lines 15-20). With respect to claims 9 & 18, the cathode

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material is Li_2S_2 , Li_2S_4 , Li_2S_6 , Li_2S_8 or Li_2S_{12} (col. 6, lines 35-40). With respect to claim 14, the conductive agent is carbon powder, carbon fibers, graphite, acetylene black or graphite fibers (col. 8, lines 1-5). With respect to claims 15, 19 & 20, the negative electrode is lithium metal or a carbonaceous material (col. 12, lines 20-25) and the electrolyte comprises a lithium salt such as LiClO_4 , LiCF_3SO_3 and/or $\text{LiN}(\text{CF}_3\text{SO}_2)_2$ (col. 7, lines 50-60) and a nonaqueous solvents such as propylene carbonate (col. 7, lines 50-60). With respect to claim 21, the electrolyte concentration is 0.5 to 2.0 M lithium salt (col. 13, lines 10-15). The reference exemplifies the use of about 3-wt% binder in the cathode (See Examples 1-6).

Nakagiri is silent to employing at least five percent by weight of the binder (claims 1, 10, 15, 24, 26, 27, 28, 32) or the electrolyte organic mixing solvent having a solubility of sulfur of 1 to 50mM (claims 1, 11, 22, & 28).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to employ at least 5wt% binder in the cathodic material, since it has been held that discovering optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F. 2d 272, 205 USPQ 215 (CCPA 1980). The skilled artisan recognizes that the amount of binder directly effects cohesion of active material in the electrode.

With respect to claims 1, 11, 22 & 28, it would be reasonable to expect the electrolyte mixing solvents to have a solubility of sulfur of 1 to 50mM, because Nakagiri employs the same organic solvents as Applicant.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Geronov et al. U.S. Patent 6,344,293 as applied to claims 1 & 5 above, in view of Semel et al. U.S. Patent 5,298,055.

Geronov teaches a cathodic material comprising 2 to 30% of a binder blend including polyethylene oxide as described hereinabove. The reference also discloses that the electrolyte comprises organic solvents water and lithium salts (see above). Further, the reference is concerned with manipulating the dilution of the electrolyte in order to control the ion conductivity between the electrodes (col. 3, lines 30-55 and

The reference does not expressly disclose a mixing ratio between a binder and an oxide polymer of 1 to 9:9 to 1 in weight ratio.

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Semel teaches that it is conventional to employ polymer blends including 30% propylene oxide and 40% of a fluoroelastomer to increase the dusting resistance of the positive electrode (Table 4.1 and 4.2)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to employ the mixing ratio of Semel in the binder blend of Geronov, in order to increase the dusting resistance of the positive electrode.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nakagiri et al. U.S. Patent 6,576,370 as applied to claims 1 above, and further in view of Carson U.S. Patent 6,488,721.

Nakagiri teaches a cathodic material comprising a polyvinyl pyrrolidone binder as described hereinabove.

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The reference does not expressly disclose mixing the binder with isopropyl alcohol in the cathodic mixture.

Carson teaches that it is well known in the art to employ isopropyl alcohol in the cathodic mixture in order to increase dispersion ability of the cathodic material (col. 26, lines 55-68 and col. 27, lines 1-8).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to employ isopropyl alcohol in the cathodic material of Nakagiri, in order to increase dispersion ability of the cathodic material.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nakagiri et al. U.S. Patent 6,576,370 as applied to claims 1 above, and further in view of Igarashi et al. U.S. Patent 6,573,004.

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Nakagiri teaches a cathodic material comprising an acetonitrile solvent as described hereinabove.

The reference does not expressly disclose mixing the solvent with polyvinylacetate in the cathodic mixture.

Igarashi teaches that it is conventional to employ polyvinylacetate in cathodic mixtures in order to minimize reduction in capacity at repeated charge-discharge cycles (col. 3, lines 5-35 and col. 5, lines 10-45).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to employ polyvinylacetate of Igarashi in the cathodic mixture of Nakagiri in order to minimize reduction in capacity at repeated charge-discharge cycles.

Response to Arguments

Applicant's arguments with respect to independent claims 1, 15, 24, 27, 28 & 32 have been considered but are not persuasive. Applicant asserts that the subject inventions is neither obvious or anticipated by Geronov '293, because the amendments have now excluded tetrahydrofuran, propylene carbonate and ethylene carbonate as organic mixing solvents. There is no support for the amendments in the specification and therefore, Applicants arguments are moot in view of the new matter rejection under 35 U.S.C. 112 first paragraph.

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The 35 U.S.C. 103 obviousness rejections of claims 7 & 8 over Nakagiri is maintained because there is no support for the amendments in the specification and therefore, Applicants arguments are moot in view of the new matter rejection under 35 U.S.C. 112 first paragraph.

The rejection of claims 1-4, 6,9,11,12, 14-20, 22-24, 27 & 28-35 under 35 U.S.C. 102(e) as being anticipated by Nakagiri et al., U.S. Patent 6,576,370 is overcome. The reference does not anticipate employing a binder in at least five percent by weight of the electrode material. This limitation is clearly supported by the specification, and therefore, the rejection is withdrawn. However, claims 1,4, 6, 9-11,14-15, 17-22, 24-27 & 28, 30-32 & 34-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakagiri et al. U.S. Patent 6,576,370. The instant claims are obvious over Nakagiri, because even though the reference teaches the use of propylene carbonate and ethylene carbonate solvents, exclusion of said solvents by the amendment is not supported by the specification. Therefore, Applicant's arguments are moot in view of the new matter rejection under 35 U.S.C. 112 , first paragraph.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

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§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Monique Wills whose telephone number is (571) 272-1309. The Examiner can normally be reached on Monday-Friday from 8:30am to 5:00 pm.

If attempts to reach Examiner by telephone are unsuccessful, the Examiner's supervisor, Randy Gulakowski, may be reached at 571-272-1302. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Mw

03/31/04

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